

CLEAN AIR PLAN
SAN LUIS OBISPO COUNTY

APPENDIX C

STATIONARY SOURCE CONTROL MEASURES

by

SAN LUIS OBISPO COUNTY
AIR POLLUTION CONTROL DISTRICT

and

JACOBS ENGINEERING GROUP
PASADENA AND SANTA BARBARA

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I. MP-1 RESIDENTIAL WOOD COMBUSTION

II. EXISTING REGULATION

The federal Environmental Protection Agency (EPA) currently regulates manufacture and sale of woodheaters intended for space and water heating. Emission levels of traditional fireplaces are not regulated, whether factory built metal units, precast concrete, or masonry. EPA's woodheater performance standards are being implemented in 2 increments, with Phase I limiting emissions from units sold after July 1, 1990, and the more stringent Phase II emission limits taking effect after July 1, 1992. Currently, there is no APCD regulation of wood burning appliances. Title 24 of the California Code of Regulations requires most fireplaces in new construction to have doors and an external source of air.

III. BASELINE EMISSIONS

ARB Inventory category: Residential Wood combustion

YEAR	<u>1987</u>	<u>1994</u>	<u>1997</u>	<u>2000</u>
ROG (t/y)	603	756	799	843
NOx (t/y)	69	87	92	97
PM10 (t/y)	647	812	859	905

Daily emissions are not reported here because the category 'Wood Combustion' is not part of the Planning Emissions Inventory. The emission inventory tables in the 1991 Clean Air Plan and the Plan's Appendix A do not these reflect these numbers, but they will be added in future Plan updates.

IV. CONTROL MEASURE DESCRIPTION AND EFFICIENCY

This measure is included in the 1991 Clean Air Plan for several reasons. In the early 1980's, EPA regulations caused woodstove manufacturers to develop cleaner burning units. APCD installed PM10 monitoring equipment in the late 1980's, which showed that most PM10 violations occur in winter months. About the same time, other areas in the western U.S. implemented winter PM10 control programs to reduce woodsmoke emissions, many of which have been very effective in improving winter air quality. In 1989 the ARB and the California Air Pollution Control Officers Association developed the Suggested Control Measure for the Control of Residential Wood Combustion. ARB expects districts to utilize this measure a guide for development of local control programs, which has been done here. Suggestions from industry and the public have also been included where appropriate.

During winter months, wood burning contributes a significant amount of PM10 to the total pollutant burden, especially in areas which experience nocturnal stagnation. Violations of the PM10 standard occur about one day in 5 in inland communities where woodburning is a common form of heating. PM10 concentrations about 10% below the standard occur on an additional 15% of winter days in these areas, indicating that relatively small emission increases may cause significantly more violations.

Analysis of PM10 exceedances in a community where woodsmoke is believed to be a significant contributor is provided in Sec. XVII.

EPA Phase II emission standards have caused wood heater emissions of NOx and ROG to drop at least 50% and PM10 emissions by over 80% below those emitted by traditional fireplaces and conventional woodstoves. Unpublished industry data show that in-use fireplaces and woodstoves are much more polluting than the laboratory values used for calculation here, hence real world emission reductions will likely be greater than presented in this measure. Use of cleaner technology wood heaters can reduce emissions from both existing sources and from new homes (about 70% of which contain conventional fireplaces).

Year 2000 Control Efficiency is about 13% for ROG and NOx, and 21% for PM10.

The proposed measure consists of the following components:

A. Allowing Only Installation of Devices Meeting EPA Phase II Emission Standards.

No person would sell, install, or transfer for use in the county any wood heater, including zero-clearance fireplaces (a premanufactured fireplace set into the wall), unless it meets EPA's Phase II emission limits. Certain woodburning devices could be exempted by the APCD if they meet Phase II emission standards but cannot be certified by EPA (such as pellet heaters, gas logs, and certain fireplaces). A list of approved appliances will be published in the regulation and updated periodically. A phase-in period could allow vendors to sell existing stock which does not meet emission limits. The sale or transfer of uncertified appliances would be prohibited after the phase in period.

B. Installation of Wood Burning Appliances in New Construction

Only devices meeting EPA Phase II standards, including fireplaces, would be allowed in new construction or substantial remodeling (50% of floorspace). The District would develop agreements with local agencies, so that building inspectors would verify that the appliance meets air quality requirements using certification information provided by the District.

C. Replacement or Retrofit of Existing Wood Stoves Upon Sale or Transfer of Real Property

No person would sell or transfer a residence that contains a wood heater which is not certified, permanently disabled, or exempted by the rule. Units whose emissions meet EPA emissions limits but are not certifiable for technical reasons (e.g. pellet stoves) could remain.

D. Voluntary Curtailment

The District would request a voluntary curtailment on wood burning whenever an air quality episode is declared for a specific geographic area. Experience in other western communities show that voluntary curtailment reduces wood burning by 20% to 30% on days when alerts are called by air pollution control officials.

The program would focus on curtailing use of nonapproved devices that are not a primary source of heat first. With proper public education, this could encourage a voluntary retrofit to EPA certified devices by those who wish to burn even during periods of curtailment. Public notice of wood burning curtailment would be provided through the media, a recorded telephone message, or other suitable means. Currently, the District does not have capabilities for the real time analysis of PM10 and local meteorology that are needed to implement this program, but an enhanced PM10 data gathering effort is being considered for the winter 1991/92 season.

In King Co. Washington, persons wishing to install a woodstove must purchase a permit for \$50. This fee funds curtailment and other woodsmoke abatement programs. A fee program could be adopted here to help fund forecasting and curtailment activities.

E. Public Awareness Requirements

With each sale of a wood heater, retailers would be required to supply public awareness information on the following topics:

- Proper operation and maintenance of wood heaters and stoves.
- Proper fuel selection and use.
- Home weatherization methods.
- Proper sizing for wood heaters.
- Health effects of wood smoke.
- The importance of and methods for storing fuel to keep it dry.

The state Air Resources Board has prepared a simple and attractive handbook on how to minimize woodsmoke emissions. Industry has also prepared similar information. Either of these sources are inexpensive and readily available to retailers and the District for public information programs.

Wood sellers might also be required to provide information to customers on proper wood burning practices. Notice might be attached to green and seasoned wood, describing drying and storage procedures and the problems associated with burning unseasoned wood (e.g. excess smoke and creosote formation).

Woodsellers could also provide simple woodburning handbooks (as the dealers would) with all wood sold.

V. SOURCES AFFECTED AND EMISSIONS SUBJECT TO CONTROL

Vendors, distributors, contractors and homeowners who currently own nonconforming woodburning devices would be affected. Distributors and contractors would shift sales from all types of woodburning devices to only those meeting Phase II standards. Homeowners would have to retrofit, disable or remove noncomplying woodstoves prior to transfer of property title. Existing fireplaces would not be affected, and certain devices such as pellet stoves would be exempt. There are over 100 different models of freestanding wood heaters which meet EPA standards. Manufacturers have also developed woodheaters that look like traditional fireplaces, but meet Phase II standards; at least 30 different models are now available at various retail outlets in the county. The fireplace industry is currently developing new designs for traditional type fireplaces which will also meet Phase II standards.

VI. PROJECTED EMISSION REDUCTIONS

The following reductions are expected from implementation of sections A, B, and C.

	Expected Emission Reductions (Tons per Year)		
	<u>1994</u>	<u>1997</u>	<u>2000</u>
ROG (t/y)	13	49	107
NOx (t/y)	2	6	13
PM10 (t/y)	22	101	187

This measure acts primarily to reduce the projected increase in residential woodburning emissions resulting from population growth. With implementation of this measure, existing PM10 emissions from this source are expected to drop just 1.5% between 1991 and 2000 (decreasing from 729 t/y in 1991 to 718 t/y in 2000).

VII. ENFORCEABILITY

The APCD would adopt a rule regulating woodburning devices as proposed in the measure. The following describes how each section of this measure may be enforced; however, this is conceptual only and may undergo significant changes.

Section A and B: The District would enter into agreements with local agencies to allow only Phase II units in new construction. This could be accomplished during the Plan Check process at local planning agencies. The District would regularly supply building inspectors with an updated list of allowed units. Inspectors would verify that a unit from this list is actually installed. The District will endeavor to inform architects and local agencies well in advance of rule adoption so that new construction can be designed to accommodate allowed units.

Section C: The District would inform realtors and escrow and title companies of the retrofit provisions for woodstoves well in advance of rule implementation. The District could allow sellers of homes which do not contain a woodstove to request exemption, simply by filing a simple form. This program has been effective in Washoe Co. NV for the past three years. The District could audit a percentage of the homes, to verify that no stove exists.

Certified or licensed inspectors would verify that homes requiring retrofit have only an approved unit installed. Candidate inspectors are existing chimneysweeps, dealers, and certified home inspectors. Many dealers might provide a certificate of compliance as part of sale and installation at no extra charge. If others perform the service, the cost is estimated to be about that currently charged by chimneysweeps for a simple inspection, around \$25 to \$35.

The District would develop a program to verify home transfers with the County Assessor. It appears that the Assessor's office could provide the District with a computerized listing of transfers using Assessor Parcel Numbers. This data could be evaluated by computer with District records of exemption and

inspection, to verify that all property transfers are accounted for under the rule. This verification would require some computer programming to initiate, and would require District inspectors to regularly inspect records and contact any persons whose home was not exempted or inspected.

VIII. COST-EFFECTIVENESS

The range of costs for reducing aggregate ROG, NOx, and PM10 emissions by implementing the retrofit parts of this measure is about \$3095/ton to \$5216/ton. Costs for allowing only approved devices in new homes would be small because clean burning heaters are much more energy efficient than traditional fireplaces. Thus, higher initial costs are offset by savings in fuel use. District costs to implement a voluntary curtailment program could range from about \$10,000 to \$30,000 per year, depending upon needed monitoring equipment and staff, or consultant costs. An effective public education program would require minor additional expenditures by dealers and the District. See section XVI for cost effectiveness documentation.

XI. HEALTH, WELFARE, ENERGY, AND SOCIAL IMPACTS

Although pollutant emissions shown in section III are expressed as yearly totals, the vast majority of woodburning occurs between November and March, causing a much greater impact on local air quality than would happen if the emissions were distributed throughout the year.

Woodsmoke can be a profound respiratory irritant. The detrimental effect of woodsmoke is most pronounced on infants, the elderly, and those with temporary or chronic pulmonary conditions. In Klamath Falls, Oregon, which has a severe woodsmoke problem, winter studies found that all of the children tested at an elementary school suffered from asthma as a result of smoke exposure. Woodsmoke also contains many known toxic, mutagenic and carcinogenic compounds. Reducing smoke during periods of atmospheric stagnation would benefit community health and reduce smoke complaints received by the District.

Certified devices have efficiencies of 70% or greater, while nonconforming woodstoves are about 55% efficient. Traditional style fireplaces have efficiencies of +/- 10%. Thus, certified woodheaters use substantially less fuel, so that less pressure for cutting live trees may result from adoption of this measure. Also, increased efficiency could significantly reduce energy demand for space heating. Awareness provisions such as those for weatherization and insulation should also help conserve energy. Higher efficiencies associated with EPA approved wood heaters reduce creosote buildup, which is the principal cause of chimney fires. The reduction in wood burned because of higher efficiencies will also reduce the amount of global warming gases emitted.

Homeowners may experience complications when transferring property title because of retrofit provisions. Chimney sweeps, contractors, and vendors may have increased business opportunity because of retrofit provisions.

X. JURISDICTION

This measure would be implemented by District rule making. Enforcement agreements with local agencies may be required. EPA enforces performance standards for wood heaters, which are set forth in Part 60, Title 40, Subpart AAA, Code of Federal Regulations, February 26, 1988.

XI. ESTIMATED DATE OF ADOPTION

March, 1992.

XII. IMPLEMENTATION SCHEDULE

Proposed actions would be implemented on the following schedule:

- | | |
|-----------|--|
| July 1992 | Allow only installation of devices meeting EPA Phase II emission standards (phased-in to allow for sale of existing stock).
Restrict used wood heater sales.
Only District certified wood heaters in new construction. |
| Nov. 1992 | Fuel moisture education and public education.
Voluntary curtailment during episodes. |
| Jan. 1993 | Retrofit wood stoves upon transfer or sale of home. |

XIII. RESOURCES

District staff time is required for rule development and interagency agreements. Building inspectors and local agencies would also have increased workloads. If a voluntary curtailment program is adopted, the District may need to procure monitoring equipment at a cost ranging from \$10,000 to \$20,000. The District could also subscribe to a computer meteorology bulletin board service, and during winter months devote about 10 hours/week staff time to the curtailment analysis and notification. Alternatively, the District could contract with a private weather forecaster to call curtailments, as is done in Colorado Springs, CO.

XIV. RECOMMENDATION

This measure is recommended for adoption.

XV. REFERENCES

1. A Proposed Suggested Control Measure for the Control of Emissions From Residential Wood Combustion, Technical Support Document. CAPCOA Tech. Rev. Group and ARB Stationary Source Division. October, 1989.
2. Woodstove Field Performance in Klamath Falls, OR. Wood Heating Alliance and Elements Unlimited. April, 1990.

3. Performance Standards for Residential Wood Heaters. U.S. EPA 40 CFR Part 60. February, 1987.
4. A Landowners Guide for Fuelwood Marketing Opportunities in the Central Coast. N.H. Pillsbury, D.P. Williamson June, 1980.
5. Communication to: Air Pollution Control Board members from Guy Fasanaro, President Wood Energy Institute West, Calif. Chpt., concerning Field Performance of Advanced Technology Woodstoves in Glens Falls, New York, 1988-1989. (Industry study).
6. Supplemental Report to Fresno City Council on the Continued Woodburning Regulation Package. A.P. Solis. October, 1990.
7. Air Quality Management Plan for the Town of Mammoth Lakes. Great Basin Unified APCD. Nov. 1990.
8. Personal Communication. Duane Ono, Deputy APCO, Great Basin Unified APCD.
9. Compilation of Air Pollution Emission Factors, 4th ed. (AP-42) U.S. EPA (woodstove data 9/90).
10. Personal Communication. John Crouch, Western Region Emissions Specialist, Wood Heating Alliance, New Plymouth, ID.
11. COST-EFFECTIVENESS District Options for Satisfying the Requirements of the California Clean Air Act. ARB, OAQP&L Sept. 1990.
12. San Luis Obispo Cities and Counties Regional Profile. S. L. O. Area Coordinating Council, March, 1990.
13. CAPCOA Indirect Source Control Committee draft Emission Reduction Calculation Procedures for Woodstove Replacements. August, 1991.
14. S.L.O. draft 1991 Clean Air Plan. pop. table 2-2.
15. Kings Co. and the state of Washington. Various woodsmoke regulations.
16. Personal Communication. Joe Hammond, Environmental Service Department, Colorado Springs, CO.
17. Personal Communication. LouEllyn Kelly, Klamath Falls, OR.
18. Personal Communication. Mike Kussow, APCO, Shasta Co. CA.
19. Personal Communication. Michael Tolmasoff, APCO, Northern Sonoma Co. CA.

XVI. EMISSION DOCUMENTATION

Calculation of baseline emissions (uncontrolled):

From the available information, it is not possible to determine the existing woodstove/fireplace ratio, therefore baseline 1987 wood combustion emissions are presented assuming that 1/2 of all wood burned is used in conventional wood heaters, and 1/2 is in fireplaces.:

- An aggregate PM10 emission factor for these two conventional sources (fireplaces and woodstoves) is $(30 \text{ lbs/ton} + 28 \text{ lbs/ton}) / 2 = 29 \text{ lbs/ton}$ for all wood burned. Therefore, 1987 PM emissions are:

$$(29 \text{ lbs PM emitted/ton wood} \times 44,686 \text{ tons wood burned}) / (2000 \text{ lb/ton}) = 647 \text{ tons}$$

An algorithm to calculate uncontrolled emissions in future years should take into account the number and types of new wood burning devices expected to be operating in that year:

$$\begin{aligned} \text{Future pollutant emissions (year)} = & \text{baseline emissions (1987)} + [\# \text{ new} \\ & \text{homes with fireplaces} \times (\text{emiss. factor} \times 0.76 \text{ cords} \times 1.829 \text{ tons/cord})] \\ & + [\# \text{ new homes with woodheaters meeting EPA std.} \times (\text{emiss. factor} \times \\ & 0.76 \text{ cords} \times 1.829 \text{ tons/cord})] / (2000 \text{ lb/ton}). \end{aligned}$$

Using this calculation method, future uncontrolled emissions from residential wood combustion are presented in section III, Baseline Emissions:

Future emissions with controls:

To calculate future year emissions, the percentage of all homes sold each year is needed, then subtract out resold homes that had already been retrofitted in a previous year. Home transfer information was supplied by the County Assessor for the 6 year period 1985 -1990. While home sales varied over the period according to the economy, on average, about 10% of all homes were sold each year. For this analysis we chose a conservative assumption that every seller will choose to retrofit, which provides the minimum potential emission reduction. When a device is removed and gas heat is substituted, greater emission reductions occur.

To calculate the effectiveness of control, it was assumed that non-Phase II devices were prohibited in new construction, and non-compliant woodheaters in existing residences were replaced by Phase II devices. Emissions in future years were calculated by the following:

- Control efficiency of Phase II devices = $1 - (\text{Phase II device emissions} / \text{nonconforming emissions})$. Control efficiencies for Phase II devices are therefore:

$$\begin{aligned} \text{ROG} &= 35\% \\ \text{NOx} &= 37\% \\ \text{PM}_{10} &= 55\% \end{aligned}$$

1993 Baseline emissions (for calculating retrofit efficiency) are:

ROG = 727 tons/yr.

NOx = 86 tons/yr.

PM10 = 780 tons/yr.

- Controlled Emissions Year_i = 1993 baseline emissions - [Baseline emissions x % homes retrofitted x control efficiency of Phase II device] + [emissions from new homes]).
- Sample Calculation: controlled ROG emissions, Year_i = 1997:
 - 1/2 of all woodburned in the county is in woodstoves.
 - Retrofit part of measure takes effect 1993, wood burning increases in 1997 to = 59,211 tons.
 - 40% residential woodburning devices retrofitted by 1997.
 - ROG Control Efficiency (CE) = 0.35%
 - New home emissions = increased wood burned from 1994 to 1997 x emission factor for Phase II device,
thus:
$$756 \text{ tons ROG} - ([756 \text{ tons ROG} \times 0.4 \text{ retrofit} \times 0.5 \text{ all wood} \times 0.37 \% \text{ CE}] + [5389 \text{ tons wood} \times 17 \text{ lb/ton ROG} / 2000 \text{ lb/ton}]) =$$
$$756 \text{ tons ROG} - 55.9 \text{ tons} + 45.8 \text{ tons} = 745.9 \text{ tons/year ROG}$$
- Tons reduced or avoided Year_i = uncontrolled emissions - controlled emission
thus:
$$799 - 746 = 49 \text{ tons/year ROG avoided in 1997.}$$

GENERAL ASSUMPTIONS:

- A. According to the "Resource Constrained Scenario" (used in the 1991 Clean Air Plan) county population is projected to increase to 239,172 by 1995, and 261,598 by 2000. It is further assumed that a household size of 2.3 persons will remain constant (ref. 12, 14), Using this information, the following information is provided as a basis for calculations:

Survey data from the County Planning Department indicate that about 10% of all homes contain woodstoves, it is assumed that all are non-EPA approved.

Households in SLO Co. (per Dept. of Finance. 1/1/89)

<u>Year</u>	<u>Households</u>	<u>Tons wood burned</u>	<u>Increase wood over 1993</u>	<u>% of all Homes retrofitted</u>
1987	81,440	44,686	---	---
1993	98,090	53,822	---	---
1994	102,116	55,031	2,209	10% x 10% = 1%
1997	107,912	59,211	5,389	40% x 10% = 4%
2000	113,738	62,408	8,586	70% x 10% = 7%

- B. According to the ARB, in the South Central Coast Air Basin 0.3 cord wood is burned each year for all households, and 0.76 cords are burned in each woodburning household. (ref. 1.).
- C. Average weight of cord of wood is 3658 pounds. (ref. 13).
- D. The following emission factors are used in this analysis, with the primary source being EPA Compilation of Air Pollutant Emission Factors Vol. 1 (AP 42):

	<u>Pounds of emissions from each ton wood burned</u>		
	<u>ROG</u>	<u>NOx</u>	<u>PM10</u>
Aggregate fireplace and woodstove +	27	3.1	29
EPA certified stove *	17	2.0	13

+ An industry sponsored study in Klamath Falls, Oregon, showed that emissions from non-EPA stoves have emissions up to 100% greater than presented here. Thus, the difference between conventional and EPA certified stoves is likely much greater than used in this analysis, but the small sample size (3 stoves) and statistical variation among samples make the data too limited for use here.

*An average figure; wide variation exists among certified units, but average emissions would probably be lower when the unit is new and small increases in emissions occur with time.

- E. 80% of new homes have wood burning device; 70% fireplace (no control), 10% EPA certified (7.5 g/hr PM std.) SLO Co. Planning Dept. Survey, March, 1990.
- F. According to the latest information available, all particulate emitted by woodstoves is considered to be 10 microns in size or less.

XVI. COST DOCUMENTATION

The range of costs of the aggregate emissions of ROG, NOx and PM reduced (avoided) is from \$3095 to \$5216 per ton. The range of weighted average cost/ton reduced for other stationary source controls is from \$33 to \$16,200. Compared with other stationary source controls, costs for reductions from this measure is deemed reasonable.

Capital Costs and Emissions Reduced

The 3 pollutants targeted for control by this measure are ROG, NOx, and PM10. According to ARB guidance, it is practical to apportion costs among the target species by simply aggregating emissions reduced and dividing by the cost of control. It is currently unknown exactly how many devices will be installed in the whole county, therefore cost effectiveness is calculated per individual unit. Considering the rapid rate of stove design improvements in recent years, emissions reduction in future years will probably be higher.

Cost of Operation:

- Reported uncertified wood stove efficiencies range from +50% to +60%; we assume 55% efficiency in this analysis.
- Reported EPA certified stove efficiency range is about 70% to 85%, we assume 75% efficiency in this analysis.
- Assume wood or pellet fuel cost of \$150/cord.
- Assume a range of costs for EPA devices from about \$700 to \$1300, flue pipe about \$300, installation varies from \$90 to \$225. Therefore, an average cost range is from \$1150 to \$1750 per unit installed.
- Assume wood costs per woodburning household are: .76 cords x \$150 = \$ 115/year.
- Assume 4090 BTU/lb wood: ($\$150 \text{ cord} / 3658 \text{ lb}$) x ($1 \text{ lb} / 4090 \text{ BTU}$) x 1,000,000 BTU / MBTU = \$10.00/MBTU for wood heat.

Energy savings:

- Assume average woodburning household burns about 3/4 cord wood each year (ref. 1).
- Assume 244 lb wood yield 1 MBTU (derived from):
 $1 \text{ lb} / 4090 \text{ BTU} : X \text{ lb} / \text{MBTU} =$
 $(X \text{ lb} = 1 \text{ MBTU} / 4090 \text{ BTU}) = 244 \text{ lb}$
- Assume 0.76 cords x 3658 lb/cord = 2780 lb burned/woodburning household.
- Energy from 3/4 cord wood = (2780 lb wood/household) / (244 lb/MBTU) = 11.4 MBTU
- Assume nat. gas cost \$8.00 MBTU

Nonconforming heater (55% efficiency)

Heat costs \$18.00/MBTU

11.4 MBTU x 0.55 = 6.27 MBTU heat available at a cost of \$112.50/yr

EPA certified Heater (75% efficiency)

Heat costs \$13.15/MBTU

11.4 MBTU x 0.75 = 8.55 MBTU heat available at a cost of \$112.50/yr

Energy savings for EPA stove = (8.55 MBTU - 6.27 MBTU) x \$8.00 x 15 yrs = \$274 fuel savings (gas not purchased)

Aggregate Emission Comparison between Phase II and traditional devices (using averaged emission factors):

- Aggregate ROG, NOx, and PM10 emissions from one non-Phase II device (traditional stoves and fireplaces) are: 82.2 lbs/year
from:
 $(27 \text{ lb} + 3.1 \text{ lb} + 29 \text{ lb}) \times .76 \text{ cords} \times 3658 \text{ lb/cord} / 2000 \text{ lb/ton}.$
1 ton wood
- Aggregate ROG, NOx, and PM emissions from one Phase II heater are:
44.5 lb/year.
from:
 $(17 \text{ lb} + 2.0 \text{ lb} + 13 \text{ lb}) \times .76 \text{ cords} \times 3658 \text{ lb/cord} / 2000 \text{ lb/ton}.$
1 ton wood.

- Avoided emissions/household = non-Phase II device emissions/household - Phase II emissions/household = (82.2 lb/yr - 44.5 lb/yr) x 15 year heater life = 566 lb.

Range of Costs per ton reduced:

- (\$1150 - \$274) / (566 lbs / 2000 lb/ton) = \$3095/ton aggregate emissions
- (\$1750 - \$274) / (566 lbs / 2000 lb/ton) = \$5216/ton aggregate emissions

XVII. ADDITIONAL INFORMATION

Each winter since its installation in late 1988, the Atascadero monitoring station has measured unhealthy PM10 levels (exceeding the state standards). No summer time PM10 violations have been observed at this station. Although other stations also have recorded winter PM10 violations over this time, the Atascadero station provides data gathered in a suburban environment not strongly impacted by large industrial sources.

24 hour measurements of PM10 are made every sixth day according to a national schedule. This sampling method is considered statistically representative of air quality trends at a given site, and is commonly used to measure PM10 pollution levels affecting the general population.

The PM10 data is organized into the two winter seasons during which measurements have been taken. The following table gives the date and quantity of PM10 measured at the Atascadero station for all months when a level near the state health standard of 50 ug/m³ was measured:

Summary of Atascadero Winter PM10 Data
Data at 90% of the standard or greater are underlined.

<u>MONTH & YEAR</u>	<u>DATE</u>	<u>ug/m³</u>	<u>MONTH & YEAR</u>	<u>DATE</u>	<u>ug/m³</u>
Nov. 1988	5	38	Nov. 1989	6	29
	11	40		12	23
	17	21		18	<u>56</u>
	23	9		24	<u>46</u>
	29	36		30	<u>50</u>
Dec. 1988	5	<u>61</u>	Dec. 1989	6	<u>45</u>
	11	<u>63</u>		12	<u>61</u>
	17	27		18	<u>50</u>
	23	20		24	<u>49</u>
	29	37		30	<u>63</u>
Jan. 1989	4	35	Jan. 1990	5	<u>49</u>
	10	8		11	32
	16	39		17	22
	22	26		23	36
	28	<u>62</u>		29	<u>43</u>

Summary of Atascadero Winter PM10 Data
continued

Dec. 1990	1	40	Jan. 1991	6	24
	7	<u>60</u>		12	20
	13	40		18	28
	19	11		24	27
	25	<u>45</u>		30	<u>50</u>
	31	<u>79</u>			

A level of 50 $\mu\text{g}/\text{m}^3$ or less is not a violation of the state standard. As can be seen, eight of the 41 days sampled (20%) in this winter study period violated the state standard. Of serious concern is that an additional six days, or 15% of the samples, in that period were 5 $\mu\text{g}/\text{m}^3$ or less below the state standard. For example, on November 30th and December 18th, 1989, levels measured were only 1 $\mu\text{g}/\text{m}^3$, or 2% below the state standard. It is therefore likely that relatively small increases in emissions would cause significantly more violations.

